INTERNATIONAL PROJECTIONIST

NOVEMBER 1954

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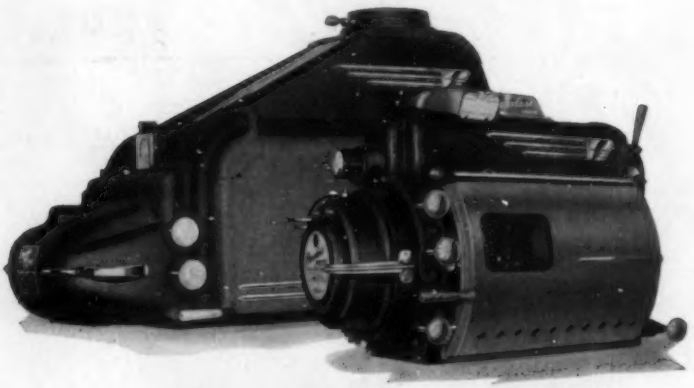

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MONTHLY CHAT

WELCOME indeed was the announcement by Earl Sponable, research director for 20th Century-Fox, at the recent joint TOA-TESMA-TEDA meeting in Chicago, that his company, acting in concert with U. S. Navy research personnel, had come up with a new alloy for use with magnetic sound reproducing heads.

The rapid wear of these reproducing heads, necessitating replacement parts within a span of six months, has long been a major concern of IP on both the technological and economic fronts, and it was a compelling reason for IP's lukewarm reception of this type of sound reproduction. No official transcript of Mr. Sponable's remarks was made available, but this IP reporter gained the distinct impression that this new alloy will increase the life of magnetic reproducing heads by three times.

Magnetic head wear, of course, is in direct proportion to the amount of film passing through the head, which fact accounts for the wide variance in head wear. IP applauds this successful onslaught on a difficult problem which threatened to impede the retention of this form of sound reproduction.

• • •

It was really something to see and to participate in the numerous joint "bull" sessions between projectionists and exhibitors at the aforementioned Chicago conclave. Practically every day several such informal sessions were held to the great benefit of all participants. No clash of forces, except on technological grounds, was apparent, this being traceable directly to the extreme informality of the discussions no less than to the recognition on both sides of their common inter-dependence.

As a matter of fact, this tacit appreciation by both exhibitors and projectionists of common problems — the former in terms of keeping their theatres open and the latter on the basis of the certain knowledge that they must have a place in which to work — has been gaining force gradually since the inception of the new projection processes. Today exhibitors are frank to state that they are dependent in large measure for the success of a given operation upon the basic knowledge and procedural know-how of the projectionist — the only technically-minded person in and about the theatre.

IP has long advocated this rapport between employer and employee; and the salutary effects of these discussions indicate the need for holding such sessions at least several times a year on a regional or even local basis.

● Given the best projector carbons made, the "rest" of perfect projection lies in the projectionist's skill and the service rendered by his supplier.

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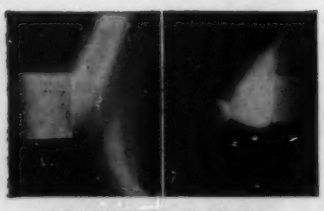

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INTERNATIONAL PROJECTIONIST

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The blessings of the new wide-screen projection processes are intertwined with the necessity, in terms of equipment and procedure, for minimizing the exaggeration of inherent projection defeats. Herewith a few appropriate suggestions as to how best this problem may be overcome.

Wide-Screen Presentation Magnifies Inherent Projection Defects

By ROBERT A. MITCHELL

THE "wide-screen" process of motion-picture projection magnifies two things — the picture, itself, and all its defects inherent in the projection process. The reasons for the poorer quality of modern wide-screen pictures are manifold. You can't mask off large areas from the top and bottom of the tiny film-photographs, magnify what's left, and get the excellent picture quality comparable with conventional projection on 3/4-proportioned, flat white screens to which we are accustomed.

For the past three decades theatre movies were sharp, crisp, brilliant, rock-steady and pleasingly lifelike. Not so today. Exaggerated aspect ratios have banished pictorial quality from the screen. Only a few theatres have resisted the lure and escaped the blight.

Graininess Increased

Excessive magnification of emulsion grain is one of the most obvious defects of wide-screen projection. Fortunately, the grain problem has been partially overcome by the VistaVision process of photography and release-printing. Applied to black-and-white prints, the improvement effected by the large-size VistaVision negative frame is startling. The improvement in color films, however, is only slight, because even the finest-grain color positive and the most carefully prepared imbibition color prints have comparatively low "resolving power."

Then, too, the lighting efficiency of the projector optical system is greatly decreased by wide-screen apertures, necessitating the use of more powerful lamps or aluminum screens, both expedients affecting image quality adversely in different ways. And the use of wide-angle, or short-focus, projection lenses decreases depth of focus, hence exaggerates film flutter, buckling, focus drift, *etc.*

We projectionists notice also another defect of wide-screen projection, which may not be immediately apparent. Just as the tiny film-photographs are greatly enlarged by the short-focus lens to fill the width of the wide screen, so also are side-sway and accidental vertical jumping or dancing of the picture highly magnified. With the advent of the wide screen, rock-steady pictures have all but vanished from the theatre!

Jumpiness an Old Problem

"Jumpy" pictures have always been the bane of the projectionist. A worn or lop-sided intermittent sprocket will cause jumpy pictures even when the movement itself functions perfectly. And a maladjusted or worn film gate can also cause serious unsteadiness of the picture.

Transient spells of picture-jumping are usually the fault of the print. The camera or the printer may be the culprit. Print unsteadiness is usually "spotted" at once by experienced projectionists; and it isn't too difficult to distinguish over-shooting of the film (due to insufficient gate tension or to "sticking" of a new print) from jumpiness which has actually been printed on the film.

But no matter what the cause of

picture-jumping, wide-screen techniques make the unsteadiness worse. Only CinemaScope, which utilizes an aperture having slightly more height than the standard aperture, is blameless on this score. CinemaScope and the anamorphic type of VistaVision are plagued not by vertical jumping of the picture but by excessive sideway or weaving. For the present we shall direct attention to the vertical kind of picture-unsteadiness, because its causes are more numerous and its corrections more troublesome.

The standard sound-film aperture is a rectangle 0.825 wide by 0.600 inch high. These dimensions result in an aspect ratio of 1.375/1 in level projection, and an aspect ratio of 1.333/1 (picture-proportion 3/4) when the projection angle is about 10 degrees.

Years of experience have demonstrated conclusively that the 3/4 picture-proportion (standard aperture) is the most serviceable for pictorial presentation. It is best for motion pictures because it is ideally suited to intimate scenes which occur with great frequency in dramatic films.

The Panoramic Effect

Higher aspect ratios have nevertheless come into use in an attempt to "open up" the screen in the horizontal dimension, even though *visual distraction* from the "center of interest" is increased in wide-screen photography and the dramatic effectiveness of "rapid cutting" and closeups is substantially reduced. High aspect ratios are best suited to panoramic and group scenes, hence their desirability for musicals and other "spectacular" productions.

It is *incorrectly* supposed by many that the newer aspect ratios more nearly conform to the visual area of the eye. The human eye actually has several different kinds of viewing areas, the outer areas being very blurred and almost color-blind. Now, the clearest area, the area of direct visual interest, has exactly the same proportions as the standard motion picture frame, namely 3/4. Beyond this is an intermediate area known as the "comfortable viewing area" which, is not so "comfortable" but that it requires us to move our eyes slightly to perceive clearly all the details it contains. The proportions of this area are approximately represented by an aspect ratio of approximately 1.85/1.

The outermost, or peripheral, viewing area is very useful in daily life, but visually too indistinct for viewing motion pictures with enjoyment. This total area roughly corresponds to such extreme aspect ratios as 2/1 and 2.55/1.

Motion-picture screens are viewed by direct vision regardless of their aspect ratios, hence the absurdity of using extended aspect ratios. The conclusion is inescapable that the most pleasing aspect ratio is the one that corresponds to the area of direct visual interest — *the standard aspect ratio of 1.37/1!*

Intermittent Defects

Now, because the height of a wide-screen aperture is less than that of the standard aperture, greater image-magnification is needed to give *the same picture-height at the screen* when the change is made from normal to wide-screen projection. And all intermittent and other film-registration faults are magnified by the same amount as the picture size is increased!

Intermittent defects which produce a certain range of picture-jump in normal projection (aspect ratio 1.37 /1) give a jump-range 21% greater with an aspect ratio of 1.66/1; 35% greater with the Paramount-sponsored 1.85/1 ratio; and 46% greater with a 2/1 ratio, the height of the picture on the screen being the same in all cases.

In some theatres a 2.35/1 wide-screen aspect ratio is used to correspond with the "optical-sound" CinemaScope aspect ratio. In this case the range of picture-jump is increased fully 71% when a picture-height on the screen identical with the usual standard picture-height is used. Sidewise weaving is increased by exactly the same percentages in all cases of *non-anamorphic* wide-screen projection.

These figures emphasize the necessity for exceptionally accurate intermittent action and film registration in wide-screen projection. There are several test films available for checking the steadiness of theatre projectors, and one of these should be used to obtain an exact measurement of the "jump factor" of each projector.

But this measurement, although simple in theory, is difficult to carry out because even the jumpiest picture likely to be encountered in any theatre "wiggles" only through a fraction of an inch on the screen. So we shall leave the matter of exact measurements to the professional technoligists.

Use of Binoculars

Because a picture on a theatre screen looks jumpy even when the picture wavers a distance of only ¼ inch or even less, the projectionist can get a good idea of the steadiness of his picture by closely examining the screen through binoculars or the Simplex X-L Screenscope. Technicolor prints are especially good for this purpose as these are usually perfectly rock-steady when in good condition. It is best to direct attention to the top and bottom edges of the picture when looking for evidence of image-unsteadiness.

It is entirely possible for a theatre projector to function so perfectly that no picture-jump can be detected even by the most careful measurements by an observer at the screen. The complete absence of unsteadiness occurs only when the slight, but unavoidable, discrepancies in the intermittent starwheel, shaft, and sprocket accidentally cancel one another. The greatest possible range of unsteadiness in modern projectors of good manufacture, however, is so small that it cannot be seen by the audience.

Six-Cycle Tremble

One of the most annoying types of picture unsteadniess is the 6-cycle "tremble" or "dancing" which immediately suggests a bent starwheel shaft or a lop-sided intermittent

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Because of continuing increased demands for more light on large indoor and outdoor theatre screens, the International Projector Corp. has announced a new modified model of the Simplex X-L projector which utilizes both water cooling and compressed air jets to reduce heat at the aperture.

An air compressor is required to provide the necessary jet air stream, and a water circulator with tank will be available for those projection rooms where plumbing is not conveniently available. Complete data on this new development, including a graphic presentation of just how it functions, will be carried in a forthcoming issue of IP.

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sprocket. This projection defect is much more noticeable than it used to be because the tremendous magnifications employed in wide-screen projection readily reveal it.

In 6-cycle tremble the entire picture moves up and down once during each revolution of the intermittent sprocket. Since this movement of the image involves 4 frames of film, and because 24 frames pass over the sprocket every second, the entire cycle is completed 24/4, or 6, times each second.

Regardless of the great mechanical precision with which intermittent movements and sprockets are made, the accuracy of film registration over the aperture is always at the mercy of the method used by the projector manufacturer to fasten the intermittent sprocket to the starwheel shaft. If the method selected is a poor one, the wobble of the sprocket may be from 20 to 40 times greater than the maximum permissible deviation from perfect form in the working parts of the intermittent.

The simplest method of fastening a sprocket to a shaft is the use of a screw inserted in a threaded hole in the hub of the sprocket. When tightened, the screw "brings up" against a flat machined in the shaft. Feed (upper) and holdback (lower) sprockets are held to their shafts in this manner.

This simple "screw-against-shaft" method is unsatisfactory for use with intermittent sprockets. Tightening the screw forces the sprocket away from the shaft on the screw side, and the resulting radial displacement of the sprocket creates a wobble as the sprocket revolves.

A certain 35-mm portable projector, now obsolete, utilized the screw-against-shaft method for fixing the intermittent sprocket. Measurements made on this machine reveal a wobble close to 60 microns (2.36 mils), most of the wobble undoubtedly being due to the unsatisfactory method of fastening the sprocket to the shaft. In a picture measuring 13½ x 18 feet projected with this machine (standard sound-film aperture), the sprocket-wobble would show up as a 6-cycle up-and-down movement of 0.618 inch, enough to be very objectionable.

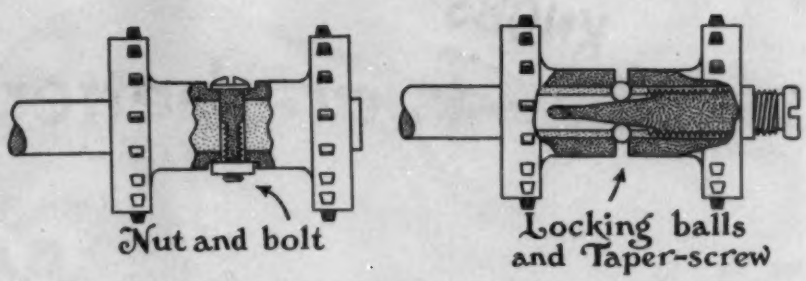

FIG. 2. Later methods of fixing the intermittent sprocket. The "nut-and-bolt method," simple and satisfactory, is used by Simplex and Philips. The excellent "locking balls and taper-screw method" is employed by Motiograph. (Not shown is the Motiograph lateral adjustment or double-bearing construction.)

Taper Pin Connection

The classical method of fixing the intermittent sprocket to its shaft made use of taper pins. There are usually two, and each is driven through holes drilled in sprocket hub and starwheel shaft. This is an effective method, as it does not create undue strain at any one point on the shaft or in the sprocket bore.

Taper pins nevertheless have a serious drawback. They must be forced into their holes rather tightly to prevent their falling out, and the forcing operation may accidentally "spring" the star shaft and introduce serious wobble. Projectionists are rightly apprehensive of the damage which might be inflicted on the delicate intermittent parts when the pins are driven into place with a hammer.

Another method, one popular in Europe, employs a screw inserted into a threaded hole in the end of the star shaft. This method, of course, is suitable only for intermittents having no outboard bearing beyond the sprocket. In one modification, the head of the screw is flat, the under-surface bringing up against the lateral face of the sprocket. In another modification, the screw-head is conical and brings up snugly in a correspondingly tapered hole.

Obviously, both the lateral face of the sprocket and the under-surface of the flat-headed screw must be very accurately machined if the first modification of the end-screw method is to be successful. Such precision greatly increases the price of both screw and intermittent sprocket. Any deviation from true, parallel planes in the surface of these two items will cause the starwheel shaft to become warped slightly when the end-screw is tightened.

In the taper-headed screw method, both the thread of the bore in the shaft and that of the conical screw must be exactly concentric and accurately fitted. The tinest discrepancy causes the tapered head of the screw to pinch the bore of the shaft and thus to force the center line of the sprocket to one side, with consequent wobbling of the sprocket and 6-cycle picture-jump.

Both modifications of the end-screw method, when properly executed, work equally well and represent a decided improvement over the taper-pin method. Maximum wobble is reduced to 30 microns (1.18 mils), resulting in a 0.309-inch picture-jump on a 13½ x 18-foot screen when a standard sound-film aperture is used.

Now let's look at the most modern methods of fastening the intermittent sprocket to its shaft.

Both the Simplex X-L and the Dutch Philips (Models FP-5, FP-6,

(Continued on page 34)

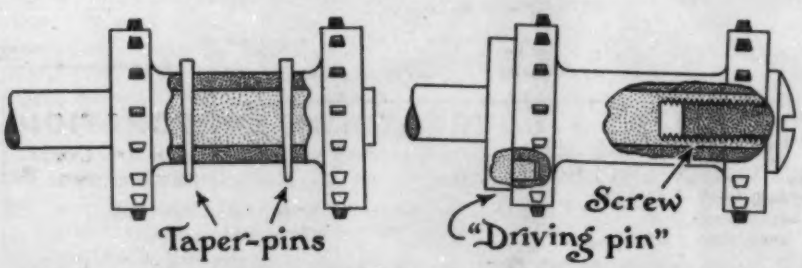

FIG. 1. Two older methods of fastening the intermittent sprocket to the starwheel shaft. Shown in the left drawing is the familiar "taper-pin method"—good, but a nuisance to sprocket-changing projectionists. On the right is shown the more convenient "end-screw method" which, however, induces sprocket wobble unless screw-head and lateral face of the sprocket are very accurately machined.

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Elements of Optical Condensing Systems

By A. E. MURRAY
Scientific Bureau
Bausch & Lomb Optical Co.

THE PRIMARY function of a condensing system is to provide maximum illumination on the *screen;* that there is usually more light on the film gate is secondary. Box-office receipts are a function of screen brightness and not of film aperture illumination. Of course, the film gate is the limiting field aperture in the projection system, and since all the light must funnel through the gate, it participates in any increase and thus its image on the screen becomes brighter. The first consideration, however, is to get more light flux to pass through the whole optical train.

The basic physical considerations dictating the present forms of condensing systems are simple. They rest on nothing more difficult than everyday geometry—the kind everyone uses when he looks at a clock or draws straight lines—plus a necessary and very convenient convention regarding the way light is propagated.

With greater demands on condensers to perform more diverse functions ever more efficiently, greater complexity has crept into their design and the primitive principles have been incorporated with more advanced considerations, without, however, losing their cogency. Our principal concern will be with the fundamentals of condenser design, both of lens condensers and mirrors.

The Nature of Light

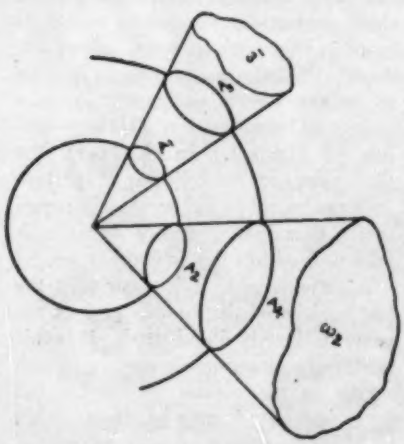
The ultimate nature of light is unknown. Perhaps it will always be so and remain one of the experiences we cannot reduce to something more primitive, along with life and the spiritual verities. Nevertheless, its behavior has been reduced to a few rules-of-thumb which are sufficient to give some control.

An ideal point source of light radiates equally in all directions throughout space, so that if it were placed at the center of a sphere, the interior would be uniformly illuminated, with no part of the wall receiving more light energy or flux than any other. It is perfectly clear that the larger areas receive greater flux in direct proportion to their sizes.

Now, it is inconvenient to circumscribe a sphere about a source each time a measurement of light flow or flux is to be made and to express the flux in terms of areas on this sphere, so the area relative to the total area of a unit sphere is used and given a special name. By analogy with plane angles, the area in question is said to subtend a solid angle at the center of the sphere. Thus we can say in more technical language that from a point source the greater the solid angle subtended by a surface, the greater the light flux intercepted; in fact, the two are strictly proportional.

It is worth while to note that these considerations are direct consequences of the convention referred to previously, that is, the rectilinear propagation of light. If light did not travel in straight lines in free space, we could not expect the inner wall of the sphere to be uniformly illuminated, and we should be forced to more complex descriptions.

FIG. 1. The light flux within the solid angles "w_1" and "w_2" is constant; but the flux per unit area (illumination) is less on areas "A_1" and "A_2" by just the square of their relative distances from the point source.



System as a Pipe Line

But it is inconvenient to represent the true state of affairs in three dimensions on two-dimensional paper, so a compromise is made. In the plane of the paper, technically the meridonional section, the solid angle subtended by a surface or a lens at point source is replaced by the plane angle, and for that infinitely thin fan of rays the flux is proportional to the angle itself.

In the case of a lens system, ideally all the flux collected by the first surface of the system is transmitted through the succeeding surfaces to appear in the image. In the image space exactly the same sort of considerations apply as at the source: the greater solid angles are associated with the brighter images. Thus the larger the area of the last surface of the system as seen from a point image, the more flux flowing through the point and the brighter it is.

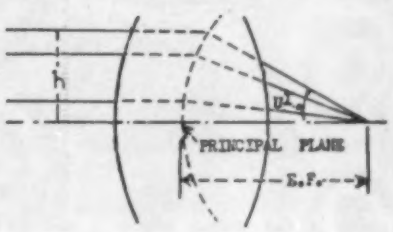
It's a curious fact, readily understood when an optical system is conceived of as a sort of pipe line for light flux, that it does not matter what the illumination or flux density is at any particular point inside the system, the illumination in the final image is fixed by the flux collected by the *first* surface and the area of the *last* illuminated surface seen from the image, *i.e.,* the solid angle subtended by the *exit* pupil.

Basic Illumination Factors

In more technical language, the illumination at a point on the axis of a system, more particularly at the image, will depend upon three factors: (1) the brightness of the source, (2) the light lost in passing through the system, and (3) the solid angle subtended by the exit pupil (loosely, the last lens surface) at the point.

In any actual optical system a certain amount of light is lost to the beam through reflection at the various sur-

FIG. 2. "h" is equal to the product of the equivalent focal length and the sine of U^1.



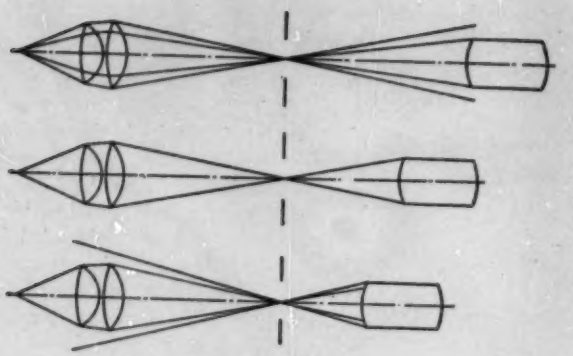


FIGURE 3.
From top to bottom: If the *f* number of the condensers is too large, light is spilled around the lens and thus wasted.
When the condenser and lens are matched, all the light is used and none is wasted—a perfect economy.
If the lens is too fast for the condensers, the former is effectively stopped down optically.

faces, and a further amount is lost through absorption in the glass. This is all taken into account in calculating the percentage of useful light passing out.

It may seem strange at first sight that in this relation there is no mention of the solid angle of the cone of light incident on the first or collective surface of the system, whereas it is obvious to the intuition that the flux through an image must depend directly upon the amount collected.

Extended Light Sources

For all well-corrected, image-forming systems (and condenser systems on the whole fall into this category) there is a proportionality between the half angles on the two sides of the system, the ratio being the magnification. The situation at any other point on the axis is slightly more complicated, but in essence the same physical considerations apply.

In practice, we have not to deal with point sources but with actual extended sources, which act somewhat differently from the commonly considered point origins. The extended source has area, *i.e.*, is an assembly of point sources of finite luminosity and must be treated as such.

Considering more specifically condensing systems, fundamentally their function is to image the light source at the most convenient point in the projection system for optimum performance of the whole system. It is clear that the instance when a source can be placed at the gate of a projector are very few, and as yet those sources amendable to this treatment are quite feeble.

Screen Light Determinatives

The condensing system, then, has the duty of placing the next best substitute for the source, its image, at that point in the system where it will do the most good. By principles previously established, it does not matter where with respect to the projection objective the source image is placed: the illumination on the screen will depend only upon the source brightness, the transmissivity of the system, and the overall *f* number.

It is clear from this illustration that when a point source is imaged at the film gate for maximum utilization of the flux through the system, the cone of light from the condensers must just fill the projection objective, *i.e.*, the *f* number of the condensing system at the film gate must match the *f* number of the objective.

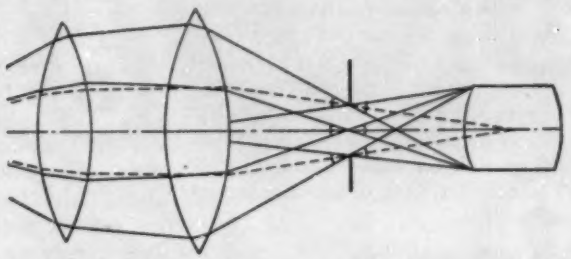


FIGURE 4.
It is necessary to match the *f* numbers of the condenser and the projection objective even though the source be imaged in the latter. Note that the marked angles at the film gate are approximately equal.

If the solid angle of flux from the condensers is *smaller* at the gate than the objective will accept, the latter is stopped down optically, the overall *f* number is smaller than the condensers are capable of, and they are not working at full efficiency.

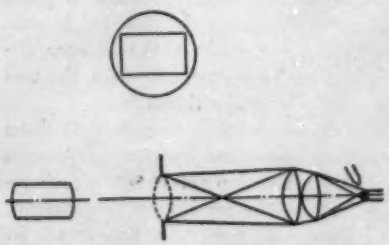


FIG. 5. The common procedure in 35-mm arc projectors. Above: the arc crater is imaged on the film gate. Below: The arc image must be larger than the film gate.

On the other hand, if the condensers deliver a solid angle *greater* than the objective can accept, light is spilled around the objective and fails to get to the screen. In this case, the condensers are optically stopped to the *f* number of the projection system.

Essentially the same considerations apply in the second type of source imaging—when the source is imaged inside the projection lens, or, more accurately, in the entrance pupil of the objective. In this arrangement the basic conditions are somewhat less clear, but a moment's thought will show why here, too, the *f* number of the condensers must match that of the projection lens or the smaller stop becomes the limiting factor.

Arc vs. Tungsten Light Sources

In practice, with extended real sources the first arrangement, that of imaging the source at the film gate, can be used only with those sources which are uniformly bright over their area, which means that it is confined to arcs. The second method is generally employed with tungsten sources, which are used most generally outside the field of 35-mm motion picture projection.

[Such diverse applications as substandard motion picture projection, slide projection, and photo enlargers employ this arrangement, which indeed is the only one which can be used to assure screen uniformity with a source as non-uniform as the incandescent filament. In this case, the film gate, or field limiting aperture (the conjugate to the screen) is necessarily illuminated evenly because it falls well within the convergent cone.]

As a sidelight, it is clear that the last surface of the condenser lens appears uniformly illuminated. It is this uniformly illuminated surface which serves as the virtual source for the gate, wherever it may be, from within

(Continued on page 32)

From Toy to a Great Industry

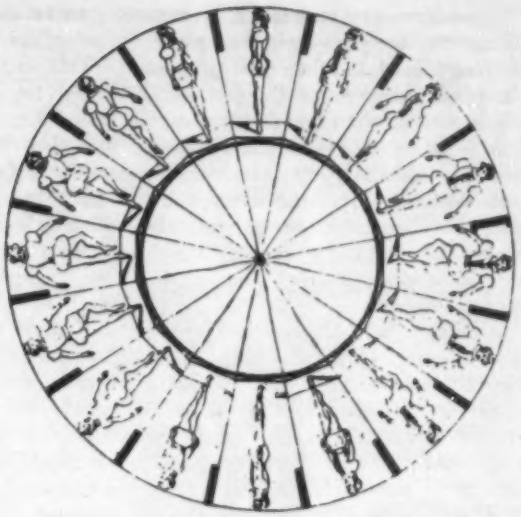


FIG. 1. The Phenakistoscope, or "magic disc," designed by Joseph Plateau in 1832, first demonstrated persistence of vision.

By JACK E. GIECK

The terms "discovery" and "invention" are often loosely applied to the development of motion pictures. Actually, many minds, many hands contributed greatly thereto, as is made clear by this first of a series of articles which appeared originally in "Movie Makers" magazine, to which we are indebted for many favors.

DID YOU know that the first motion pictures ever taken were in 3-D? Or that stereophonic sound dates back to 1922? lip-synchronized sound having been demonstrated before the turn of the century? or that color movies were shown as early in 1894?

Although these facts may be surprising to some of us recently exposed to various motion picture "innovations," they point up the maxim that movies, like most great inventions, were not created in a "flash of genius" by any one man. Rather are they the product of a technological evolution extending over more than a century.

This process involved the gradual improvement of a number of crude but novel devices—often mere toys —by several generations of gadgeteers and tinkerers (even as you and I) many of whom worked on these hobbies in their spare time.

A wide variety of early projection devices have been collected by the Henry Ford Museum, Greenfield Village, Dearborn, Michigan, source of most of the accompanying illustrations. (Projectionists visiting Washington, D. C., can see another fine collection of early cameras and projectors at the Smithsonian Institute.) But before examining these antiques in greater detail, let us trace some of the fascinating history of "living pictures," as they were called until the beginning of the 20th century.

Roget's Persistence of Vision

The magic lantern was already 160 years old when Dr. Peter Roget happened to notice the peculiar distortion of carriage wheels when viewed through a slatted fence. Based on this discovery, he presented a paper on the persistence of vision before the British Royal Academy in 1825. However, nothing very practical came immediately out of Roget's observations. To be sure, for the next few years a number of physicists spent their leisure hours staring at the world through whirling discs with holes punched in them.

Then, in 1832, a Belgian optical scientist, Joseph Plateau, whimsically drew some figures on the back of one of these slotted shutters to dramatize an effect he had obtained. Plateau called the result a "Phenakistoscope," thereby establishing a precedent followed by the next several generations of living-picture experimenters of assigning ridiculous names to their contraptions.

Prove It To Yourself

Plateau's "magic disc," as the public called it, is shown in Fig. 1.

FIG. 2. The Zoetrope, a cylindrical version of the magic disc first shown in 1833, was another step forward in crystalizing the idea of commercial motion pictures.

The reader may operate it by cutting it out from the page and pasting it on thin cardboard and then punching out the black slots around the periphery. Next, stick a pin through the center, hold it up before a well-lighted mirror, and peer through the back of the slots while spinning the disc on the pin. The figures in the mirror will appear to dance, for reasons which will be obvious to most motion picture technicians.

Although the individual images are not stopped while they are being viewed, as is the case with a modern projector, the slots in the "shutter" are so narrow that each "frame" is glimpsed for a very short "exposure" time, thus minimizing sidewise blur. And persistence of vision hangs onto the image until a new one appears through the next slot.

A year after Plateau's Phenakistoscope, William G. Horner (England) introduced his "Wheel of Life". Two of these "Zoetropes," as they were christened, are shown in Fig. 2. This device is essentially a cylindrical version of Plateau's device. The figure drawings depicting successive stages of motion are printed side-by-side on a band of paper which is bent around the inside of the cylinder. Several of these cards may be seen behind the Zoetropes in the illustration. When the drum is rotated on its axis, the observer watches the figures perform through the vertical slots in the side.

The pictures in the hooded model on the right were illuminated by a candle in the center of the cylinder. These two machines were manufactured in 1867 by Milton Bradley Co., Springfield, Mass.

This sort of thing was not exactly suited to mass audiences. An Austrian army lieutenant, Franz von Uchatius, hit upon the idea of *projecting* living pictures. His technique was to combine Plateau's idea with the magic lantern, or rather with 12 magic lanterns. What he did was to make a series of 12 drawings upon a glass disc which he mounted on a stationary frame. In front of each transparency he then mounted a projection lens, aiming all 12 lenses at exactly the same point on the screen.

Behind the glass disc he fastened his single light source, a limelight, on the rim of a wheel. (The limelight predated the carbon arc in magic lanterns and theatre spotlights. It consisted of a small cylinder of unslaked lime, one end of which was heated white-hot by an oxyacetylene gas jet.) When he turned the wheel, the *light source* moved from one picture to the next, changing the picture on the screen through the 12 positions of the action as each transparency was illuminated in turn. Thus, in 1853, Uchatius projected the first movie—actually, an animated cartoon.

Photography was unable to contribute much to motion picture technology at this stage because of the extreme slowness of the wet plates which served as film at that time. Exposures were often reckoned in *minutes*, and portrait subjects generally had their head clamped in metal jigs to hold them still long enough.

Nevertheless, Dr. Coleman Sellers, a Philadelphia physician, began experimenting with series-pictures of *posed* motion in 1861. These he took with one of the popular twin-lens cameras of the day, and he mounted his stereo-pair prints on the endless belt of a viewer which was similar to the Becker Stereoscope (vintage 1857) Fig. 3, except that he replaced the

(Continued on page 30)

FIG. 3. The Becker Stereoscope of 1857 led to Coleman Sellers' Kinematoscope in 1861, the first peep-show movie unit.

Preparing a Theatre For VistaVision

by F. W. MacDONALD

Member, IA Local 199, Detroit, Mich.

SETTING up a wide-screen projection system to provide a 1.85/1 aspect ratio, such as is prescribed for VistaVision pictures, can be quite a chore when the projection angle is steep, as it is in most balcony theatres. The accompanying keystone presents two serious problems—(a) proper screen masking of the distorted image, and (b) aperture registration with respect to the film frame. Outlined herein is what I consider a positive method of achieving these results:

(1) Insert the proper projection lens to be used for the wide picture.

(2) Make up a 15-foot loop of standard VistaVision stock and run it on the unmasked screen *without an aperture plate* in the projector. The exact picture width is now defined on the screen for a lens of this focal length, part of which is unusable.

(3) Hold a plumb line at the *upper* left corner of the screen image six inches inside the sound track, and chalk-mark the center of the bob on the stage floor. This mark establishes the left side vertical masking boundary. Mark the stage floor for the right side vertical masking boundary by dropping a plumb line from 6 inches inside the *upper* right corner of the screen image.

(4) Using plumb lines centered on the two chalk marks, install the right and left vertical masking.

(5) For an aspect ratio of 1.85/1, measure the distance between the two reference marks and multiply by 0.54 to obtain the height of the picture. Then install the top horizontal masking.

(7) Starting with a blank aperture plate, drill a small hole and with a wide screen carefully file out to the screen masking.

It should be borne in mind that direct proportion between aperture film frame and picture exists only when the projection slope is zero. As the projection slope increases, this relationship is upset progressively. A slope greater than 18 degrees will therefore require excessive vertical cropping if the 185/1 ratio is to be maintained. With this condition, it is advisable to increase the screen height beyond 0.54 times the width.

TransVerteR: Source of Flickerless Arc Power

By WILLIAM SMART
The Hertner Electric Co.

THE word "TransVerteR" has long been synonymous with a source of steady flickerless power for motion picture projection. For nearly 50 years thousands of theatre owners have depended on the TransVerteR as their power source for dependable arc lighting. There are now seven types of TransVerteRs that meet practically all requirements of the theatre projection lamps offered today.

The types of TransVerteRs manufactured are as follows: LV 40/80 at 33 volts D. C. for 1 kw projection; the HI type at 48 volts D. C. is manufactured in two sizes: 50/100 with capacity of 50 amps per lamp standard projection cycle, and the HI 70/140 with capacity of 70 amps per lamp standard projection cycle. The HIH type TransVerteR is also manufactured in two sizes with the same capacities as the HI but at 60 volts D. C. This allows for the use of a spotlamp where required.

The HS 115/230 TransVerteR is manufactured with capacity of 115 amps per lamp standard projection cycle at 75 volts D. C. The MA 80/160 TransVerteR at 85 volts D. C. is supplied where a little higher voltage is required than the HS can supply, but at a lower ampere capacity.

The type HT 135/270 TransVerteR is the newest addition to the TransVerteR family. This gives a burning rate of 75 to 135 amps with a generator voltage of 90 volts D. C.

The type CP TransVerteR is manufactured in two sizes: 200 and 250 amps with a generator voltage of 100 volts. The rating on the CP TransVerteRs is continuous, with an overload rating of 50% for one-half hour. This is different from the other types of TransVerteR which have a continuous rating with a five-minute overload period.

Manufacturing Processes, Materials Pay Off

All TransVerteRs are equipped with pre-lubricated ball bearings that require no lubrication for the life of the bearing. In the manufacture of TransVerteRs, aluminum has been used very generously, which means that weight has been reduced to a minimum. In nearly all types the split-field design has been incorporated, assuring the same uniformity of screen light during changeover.

For all types, the motor rotors are centrifugally-cast with virgin aluminum, assuring a one-piece, no-joint, low-resistance, lightweight, long-life, high-torque motor. This type of rotor will give top speed regulation, minimizing any fluctuations of motor speed resulting from variations of A. C. line voltage.

All TransVerteRs are now supplied with the dual type of ballast rheostats. This is a double ballast rheostat in one frame, eliminating the necessity for two mountings and installations, as would be necessary with single ballast rheostats.

The TransVerteR control panel is simplicity in itself. A voltmeter and field control regulator are mounted in a small compact box that can be installed at any convenient location within easy reach of the projectionist.

The Origin of Photography

LONG BEFORE photography made the camera a common, everyday object, it was a thing of wonder—a magic room where a living picture appeared upon the wall. "Camera" means a room, and the first cameras were just that—rooms big enough to enter. On one wall, there was a very small aperture, a pinhole, which formed an image on the opposite wall of what lay outside.

In the middle of the 16th century, a lens was substituted for the pinhole and the image became more brilliant. Buildings were constructed with a lens on the roof which threw its image onto a table.

People paid admission to gaze in awe as the world outside reappeared in all its color and movement. Street traffic could be seen hurrying by, and pedestrians strolled along unaware that they were being observed. Life cast its shadow on the wall of the *camera obscura*, but it was a living, moving shadow, replete with all its color, and lacking only a voice to make it mimic itself.

There were practical uses for the *camera obscura* beyond amusement. Astronomers found they could better study the sun in eclipse by its image than by direct observation. Artists found the optical picture helpful in solving problems of perspective, and those who could not draw merely traced the image.

Later, the camera was made smaller, a little room that could be carried around on poles like a sedan chair. It was discovered that the observer did not need to get inside the camera but could see the image plainly enough from the outside on a ground glass screen. Small cameras, resembling the viewer section of modern reflex cameras, became popular in the 18th century. The desire to reproduce the image of the camera by some means more accurate and quick than tracing it with a pen, led to the invention of photography in the early 19th century.

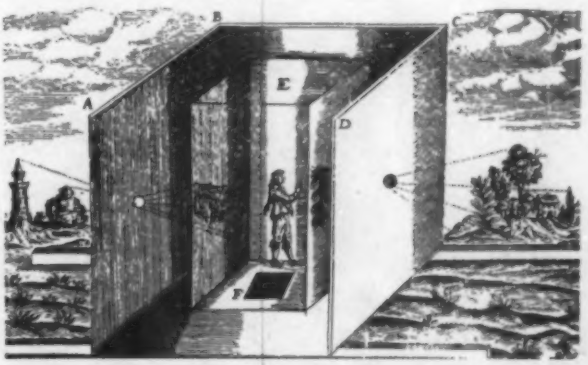
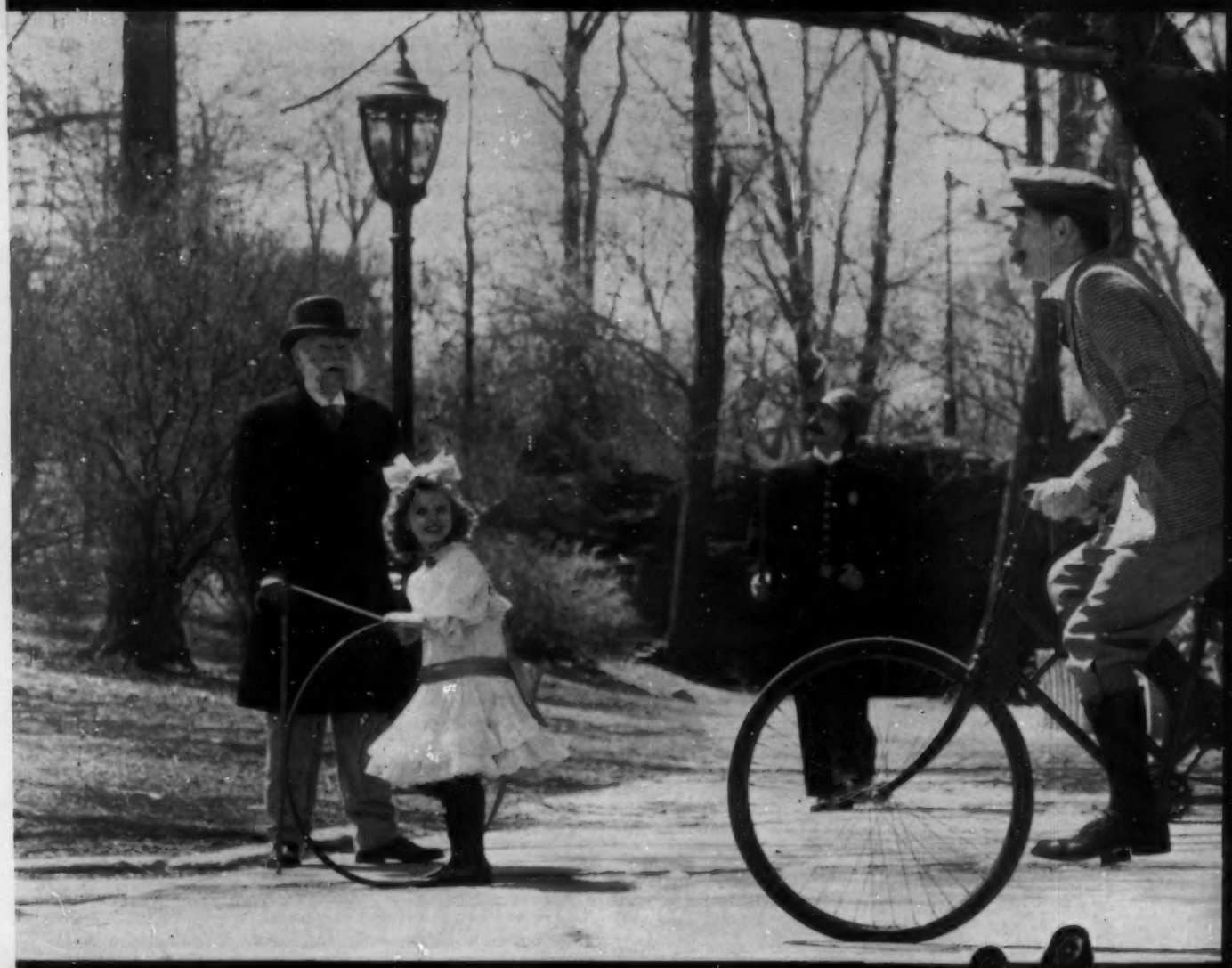


Image was traced by artist standing inside one of the first cameras, which could be moved from place to place like a sedan chair. Earliest known illustration of a "camera obscura." From the book "Ars Magna Lucis et Umbrae" (Amsterdam, Holland, in 1671).



Hearts are always young

Oldsters come—and recall, tearfully, the days of their youth. Youngsters come and find themselves heart and soul in the good old days when bicycles were built for two—and more. That's today's wide-screen entertainment as it thrills the audience—entertainment based on new technics in production, processing, projection. The Eastman Technical Service for Motion Picture Film is helping the industry master these technics. Branches at strategic centers. Inquiries invited.

and gay—*on the new, wide, wide screen*

Address: Motion Picture Film Department

EASTMAN KODAK COMPANY, Rochester 4, N. Y.

East Coast Division	*Midwest Division*	*West Coast Division*
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In The SPOTLIGHT

The function of this department is to provide a forum for the exchange of news and views relative to individual and group activities by members of the organized projectionist craft and its affiliates. Contributions relative to technical and social phases of craft activity are invited.

IP is justifiably proud of two major efforts which contribute substantially to the advancement of the projection craft on both the technological and the economic fronts. IP's intimate contact with those people who have the ultimate responsibility for the projection of motion pictures in the theatre — the life-blood of the industry at large—provides the close touch for a rational discussion of such matters.

I. After frequent and prolonged discussions with officials of Theatre Network Television, the organization which sponsors the closed-circuit Tv presentations of such diverse attractions as boxing and performances of the Metropolitan Opera Company, IP is firmly convinced that this medium offers the finest opportunity in years for increased job-hours employment for projectionists and the allied crafts.

This is a double-barrelled shotgun: the regularly scheduled closed-circuit showings of entertainment programs, but, vastly more important to our way of thinking, is the presentation in off-hours (mornings) of sales and demonstration conferences of representatives of nation-wide commercial organizations.

A case in point is the following excerpt from the IP-IA Convention issue for July of this year:

An outstanding example of how Tele-Sessions can make wide use of theatre Tv equipment and motion picture auditoriums on a nation-wide basis is the coast-to-coast sales meeting that was recently organized for the Dodge Division of the Chrysler Corp. Dodge dealers and salesmen in 29 cities were given a preview of the 1955 sales and advertising campaign.

This program originated from television studios in New York and featured top Dodge executives in addition to Tv and radio personalities sponsored by the company.

Another very successful telecast of this type was sponsored by National Dairy Products Co. This firm reasoned that if Tv was effective in selling customers on its product in the home, closed-circuit Tv in the theatre, aimed solely at its dealers and routemen, would be effective in selling them on the company's product.

Produced by the Tele-Sessions division of TNT, this program originated in the Center Theatre in New York and was piped to selected theatres in all Sealtest markets. It was a 1¾-hours show which started at 10 a.m., used 12 sets and required about 100 crewmen and 50 performers.

The foregoing is concerned with manpower and technical facilities ONLY at the originating point in New York. Simple multiplication of the manpower requirements in the larger cities to which such programs are piped will convey an accurate indication of the tremendous potentialities for additional employment provided by this medium. Enuf said.

II. Persistent and insistent demands from our people in the field that some definite program be adopted which would enable the ready indentification of the TYPE of print delivered to theatres led IP to renew its demand upon the producers and the exchanges to effectuate such a plan.

We are both proud and happy to report that IP's efforts in this direction are on the threshold of realization to the extent that in the very near future such print identification should be a routine matter for the now harrassed and slightly bewildered projectionists.

Since IP not only initiated this program but will also be consulted as to the final form of this print identification, projectionists may be assured that in future their problems in this direction will be minimized.

o Baltimore Local 181 scored a signal victory when the management of the Ritz Theatres in the Baltimore area signed a contract with the IA Local. This agreement renewed friendly relations between Local 181 and the Ritz management after a lapse of many years, during which time the theatre chain employed members of the Independent Motion Picture Projectionists' Union. Two years ago the

PROJECTION GROUP AT RECENT TOA-TESMA EQUIPMENT FORUM

Shown here is a representative group of projection men who attended the equipment forum at the combined TOA-TESMA convention, which was held early this month at the Conrad Hilton Hotel in Chicago. Seated, left to right, are: Armand Besse, Local 262, Montreal, Can.; Charles Mueller, chief projectionist at the Radio City Music Hall in N. Y. C. and member of Local 306; H. McLachlan, Local 145, Gary, Ind.; and A. L. Greer, Local 173, Toronto, Can. Standing, left to right: James J. Finn, editor of IP; August Patterson, Local 364, Akron, Ohio; identity of next man to right unknown; Joseph Bernheimer, Local 224, Washington, D. C.; Irl Gordon, Local 364, Akron; Nat Golden, director, Scientific, Motion Picture and Photographic Products Division of the U. S. Dept. of Commerce, and honorary life member of Cleveland Local 160; W. H. Ingram, Local 253, Rochester, N. Y.; James Morris, associate editor, IP, and Ralph A. Peterson, Local 219, Minneapolis, Minn.

National Labor Relations Board ruled the Independent as company-dominated and ordered it disbanded. Subsequent to this ruling, Local 181 officials were successful in organizing the projectionists employed by the Ritz Theatres, and when the contracts with the Independent expired, the theatre management entered into negotiations with Local 181. Under the terms of the new contract all IA projectionists employed by this chain will be paid time and one-half for overtime instead of straight time pay.

Representing the IA Local at the negotiations were Louis P. Sieber, president; Carroll G. Bayne, business representative, and Charles Grauling, trustee chairman. J. Lewis Gautner, managing director for the Ritz chain, acted for the theatre interests.

• The membership of Local 332, Clinton, Iowa, rejected a 5c an hour increase in pay offered by the Central States Theatre Corp., and at the time of writing were considering strike action. However, Local 322 officials are scheduled to meet with the theatre people before any strike goes into effect and it is expected that the matter will be satisfactorily settled.

• Forestalling the possibility of encroachment upon its jurisdiction by rival labor organizations (particularly District 50 of the United Mine Workers), who have been actively engaged in trying to organize the drive-in theatres in the surrounding territory, James V. Sipe, business representative of Pittsburgh Local 171, filed a petition last summer with the Penna. Labor Relations Board for an election of certification as bargaining agent for the projectionists employed in the 65 independent theatres in the Local's jurisdiction. The projectionists concerned turned out 100% and voted unanimously for Local 171 representation, thus making it the first and only IA Local in the state of Pennsylvania to be certified by the Penna. Labor Relations Board.

• Clyde Cooley was re-elected secretary of the Nebraska State Association at the recent annual meeting which was held in Omaha, Nebr. Cooley is also secretary of Omaha Local 343, a post he has held for many years.

• Sound Technicians Local 695 and Cameramens' Local 659, both of Hollywood, Calif., are making a joint effort to persuade the Association of Motion Picture Producers to put into effect a 6 p.m. shutdown at the West Coast studios. The plan was originally proposed at a meeting of the Second District, prior to the IA Convention in Cincinnati last summer, and was coldly received when presented recently before the Hollywood Film Council.

• The accompanying picture (left to right) shows Harry Strong, president of Strong Electric Corp., Toledo, Ohio; C. E. Heppberger, lighting carbon supervisor for National Carbon Co., headquartering in Chicago, and

Jimmy Strong, grandson of Harry. The picture was taken at the Strong summer home at Glen Arbor, Mich. "Hepp" states that when he arrived Harry Strong was explaining Ohm's Law to Jimmy, using several flashlight batteries, wires and meters. The teacher advised that after a few more lessons, plus a few years supported by lots of mashed potatoes, *etc.*, Jimmy will be introduced to arclamps and rectifiers.

• In the limited time at our disposal it was physically impossible for us to visit the quarters of all the companies that held "open house" and dispensed such magnificent hospitality at the recent TOA-TESMA-TEDA convention in Chicago. However, in the short time available we visited the National Carbon Co. headquarters (where the welcome mat was rolled out until the wee hours every morning), and the Motiograph quarters, where charming Mrs. Thor Matthews presided and graciously welcomed all guests. We also spent some time with the National Theatre Supply Co. personnel, the International Projector Corp. representatives, and with the Ampex people.

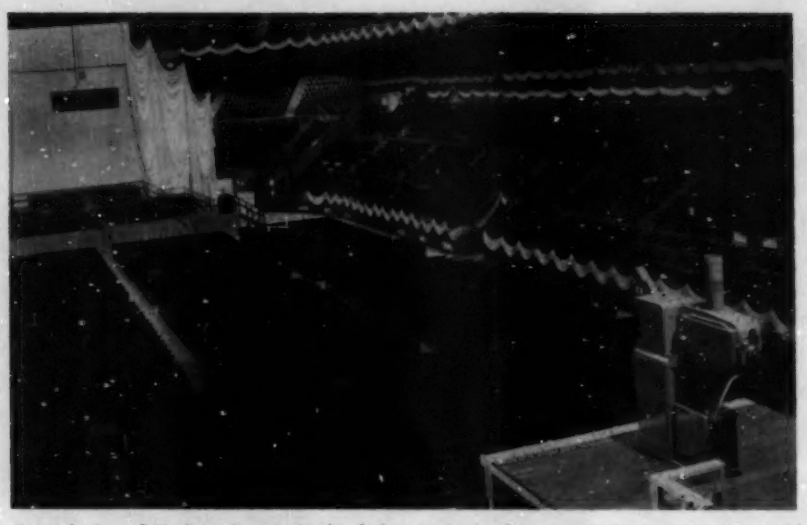
CEDRIC CARPENTER HONORED BY LOCAL 377, ITHACA, N. Y.

Acting on behalf of Ithaca Local 377, James J. Brennan, IA first vice-president (fourth from left), presents a gold life membership card to its president, Cedric Carpenter, in appreciation for 43 devoted years to the Local. The presentation took place at the recent N. Y. State Association meeting, which was held in Ithaca. Witnessing the award are, front row, left to right: Charles Wheeler (L. 108, Geneva), secretary of the N. Y. State Association; Earl Tuttle (L. 396, Binghamton), past president of the Association; Brennan; Carpenter; Robert King, Local 377 business representative, and George R. Hoener, member. Shown in the back row are Gerald C. Cowan, John Grooms, and John Dietrick, members of the Ithaca Local.

Tv-Radio as Film Theatre Aids

Tv and radio are "ideal" media and have proved conclusively their worth in bringing people into motion picture theatres. They are most effective when used on a "saturation basis" that is, around the clock. So says Earl Hudson, v. p. of American Broadcasting-Paramount Theatres.

Maybe so, say theatremen, but proof should come from strictly theatre people and not from Tv-radio interests.



General view of Madison Square Garden before projection began with the Eastman Arc Model 25 ("hard" carbon arc lighting) 16-mm projector, showing the 250-foot distance between the projector and the screen.

Giant Picture from 16-mm Film

Kodak's projection of 16-mm pictures to a Madison Square Garden audience is another milestone in this fast-growing section of the motion picture field.

THE urge to project "big" pictures is no longer restricted to the 35-mm theatre field. That the trend has spread to 16-mm circles is indicated by the recent premiere of a new educational film, "Freedom to Learn," in Madison Square Garden, New York City. This 27½-minute, full-color 16-mm film was proejected for more than 250 feet onto a screen 32 feet wide in the main arena of the Garden during the recent annual convention of the National Educational Association.

A new record was believed set when the tiny 16-mm frame was magnified more than 1000 diameters, making the total screen area covered by the picture more than 1 million times greater than that of the projector aperture. The showing was doubly impressive when it is considered that the screen used was not a highly reflective metallic type, but merely a muslin backdrop for a temporary stage erected in the Garden for the convention.

Standard Kodak Projector

The print, on commercial Kodachrome film, was projected from an Eastman Arc Model 25 sound projector. The sound output of the projector was connected with the regular Madison Square Garden sound system.

The arclamp with which the Eastman Model 25 is equipped is a 46-ampere arc designed and manufactured by the Strong Electric Corp., Toledo, Ohio. It provides an 80-minute trim when operated as specified. This is sufficient to project 2000 feet of 16-mm film (56 minutes at sound speed), the largest reel size, with an ample margin for trimming the arc in advance of the show. The film "Freedom to Learn" runs only 27 minutes, so there was plenty of margin so far as 7- and 6-mm carbon trim was concerned. Mirror diameter of the lamp is 11⅜ inches.

Joe Coco, member of IA Local 306, N. Y. City, handled the projection chore for the Eastman Arc Model 25 16-mm projector at Madison Square Garden.

In addition to the arclamp, Strong Electric also furnishes the rectifier for the Eastman Model 25 projector. This rectifier is a compact single-phase, 45-46 ampere, 32-volt, continuous 4-tube unit. The speaker and amplifier for the sound equipment are produced by the Altec Lansing Corp. The projector is available with any one of a series of five Kodak projection Ektar lenses, all *f*/1.5 aperture. The particular lens used in the Garden showing was a 3-inch *f*/1.5 Ektar, projecting a measured 32-foot wide image at an estimated throw of 253 feet.

The projectionist at this show was Joe Coco of IA Local 306. He was personally commended by Kodak executives for doing an excellent job in a situation that was "obviously both unusual and difficult." Coco himself declared after the show that "I still can't believe the size and quality of the picture that we got. When I tell different people who weren't there about the show, they don't believe me, especially when I say it was a 32-foot picture at about 250 feet."

Vast Viewing Area

Madison Square Garden, an oval auditorium seating 18,000, is not equipped for large-screen motion picture projection. Exhibition of 35-mm pictures has been arranged at least once before, but no one has ever made an attempt to project a 16-mm film on a theatre-size screen for the audience in this arena.

Biggest problem facing those preparing for the presentation was the screen itself, a temporary muslin stage background used for a pageant put on by New York City school students as another part of the program. Despite the fact that this was considerably less efficient than standard theatre screens, the quality of the results was so high that the NEA commended Eastman Kodak Co. for the excellent results obtained.

Technicolor Profits Rise

A sharp rise in profits for the third quarter of this year was reported by Technicolor, Inc., at a recent board meeting in New York. Consolidated net profits after taxes are estimated at $767,560 compared with $495,500 for the corresponding period in 1953.

LETTERS TO THE EDITOR

Projecting "Green" Prints

To the Editor of IP:

I wonder if your esteemed publication could help solve a problem that has troubled us here lately. Sometimes we have to project a film in the local cinema just a few hours after the delivery of the film from the process laboratory. Later we find that some of it has been damaged by the sprockets. Little nicks appear in the sprocket hole edges. The projectors are all new and have smooth gates and sprockets. Will you please mention some precautions which a projectionist might take to minimize this type of damage.

YOUSAF OMAR
Ambaji Villa Road, Karachi, Pakistan

EDITOR'S REPLY: If your projector and particularly the sprockets are relatively new and in good condition, the cause of damage to new or "green" film is due to too much pressure from the film gate tension pads. The emulsion on new film tends to become sticky under the heat of the projector arclamp, and increases friction at the film gate to a point where the intermittent sprocket nicks or tears the film when it pulls it down. The emulsion on older prints is harder and does not have this tendency to become sticky. According to Eastman Kodak Co., film gate tension in excess of 16 ounces is unnecessary, and settings as low as six ounces will give a steady screen image in some cases.

P. E. Cell Nomenclature

To the Editor of IP:

May I point out three errors in the text by Robert A. Mitchell, page 21 third and fourth paragraphs of his ms. in your September issue.

(1) The cells accredited to C. E. Fritts are commonly accepted as a *barrier-type* of light-sensitive cell. whereas the *photo-voltaic* cell deals with those types of cells in which two or more metals (similar or dissimilar) with prepared surfaces are in the presence of an electrolyte (liquid).

(2) C. E. Fritts was a native of New York City. It is interesting to add for record purposes that Mr. Fritts *prior to 1900* actually applied for a U. S. Patent for recording sound photographically and reproducing it by means of light-sensitive cells. The patent was abandoned because of financial reasons; but 32 years thereafter the patent was reapplied for and subsequently granted, an unheard-of record in U. S. Patent Office practice.

(3) The Photox cell referred to by Mr. Mitchell likewise belongs to the barrier-type of light-sensitive cells.

SAMUEL WEIN
Quincy, Massachusetts

[NOTE: Long-time readers of IP will recall the numerous contributions of Mr. Wein to these columns and, probably, his cognomen of "Selenium-Sam" which stemmed from his pioneer activity in the light-sensitive cell field.]

The Answer is NO!

To the Editor of IP:

I am anxious to gain information anent the "Super Panatar" prism anamorphic lens. From the articles I have read, it appears that various aspect ratios can be obtained merely by turning the scale to the desired ratios, ranging from 1/33 to 2/66 to 1. This is also claimed by the "Superscope" lens.

Should this be the correct interpretation, all that is necessary to show film on 1/33, 1/75, 1/85, 2/3 or 2/55 would be to set the pointer to the correct setting and the correct-size picture would be obtained. Could you advise if the projection lens would have to be altered for each ratio desired? Also, is it necessary to change the aperture plates for each ratio or does the "Super Panatar" lens make all the necessary adjustments?

I would appreciate your assistance, as the theatre where I am a projectionist is arranging to purchase the equipment necessary to show CinemaScope and wide screen, as well as standard pictures. Limited projection room space has to be considered together with obtaining the most suitable equipment. It is sometimes difficult to obtain the necessary information in Australia.

NORMAN G. CAMPBELL
Campbelltown, NSW, Australia

EDITOR'S REPLY: When variable anamorphic lens attachments were first marketed, IP stressed the point that no anamorphic print can be projected except in the aspect ratio for which it was "squeezed." The projection lens need not be altered for each ratio desired, nor the aperture plate either. The controlling factor is the print itself. As explained above, you can *only* project a print in the aspect ratio for which it was processed in the laboratory.

Radio-Projection Engineer Considers IP "Invaluable"

Enclosed is my subscription renewal. As an IP reader for the past 10 or 12 years, I say that your publication is certainly a great aid to me. In my dual role as an engineer at a broadcast station and as a part-time projectionist, I find IP invaluable.

In the mess that exists today in the projection field, you are really the *only* help we fellows have to explain in our terms just what the score is. Your stand for or against various systems is most commendable. Many thanks for all the past information in your magazine and keep up the good work.

JOSEPH M. WILLIAMS
Station WPOR (Local 458),
Portland, Maine

Pacific Optical Vari-Focus Lens

An optical attachment that makes it possible to vary the focal length of a projection lens has been marketed by the Pacific Optical Corp., Los Angeles. Called the "Xpansa," this lens attachment is designed to permit a theatre to project a standard (non-anamorphic) print to full screen width at any aspect ratio while using the same projection objective lens.

The Xpansa lens attachment is calibrated so that various focal-length settings for different aspect ratios can be repeated easily. All optical elements are hard coated. The Xpansa also extends a lens system so as to make unnecessary enlargement of the projection ports as is sometimes required for wide-screen projection.

Pacific's vari-focus attachment shown mounted on objective lens.

Judging a Pension Plan

Money set aside for a worker under a pension plan is real wages and not a gift even if the employer is the sole contributor. Appended are some tips on evaluating the various pension programs.

PERHAPS the most conspicuous development in recent collective bargaining history has been the rapid spread of negotiated retirement plans. As of mid-1950, about 5,000,000 organized workers were covered by contractual pension plans — a threefold increase since 1948. The number has continued to grow since then.

On the surface, this seems to represent a very substantial amount of progress toward overcoming the economic hazards of old age. Unfortunately, the figures are misleading. The *restrictions* and *limitations* of most of these plans are such that, out of the more than 5,000,000 workers described as being "covered," very few have any *real* assurance of ever actually receiving a pension.

Social Security Not Enough in Itself

The figures are, nevertheless, an indication of the manner in which unions are trying to meet the very real and human problems faced by their older members. Few union men can see their fellow-workers tossed out of the shop on their Social Security — with poverty and dependence awaiting them as the end-reward of a long, productive and dues-paying work life — without feeling that something should be done about it.

The Social Security system, even after recent improvements, still remains pitifully inadequate. A private pension plan will, therefore, seem to many to provide a sound and logical solution to the financial problems of the aged. Older members will naturally favor the idea. Younger members who can see far enough ahead to consider the time when they will be in the same boat, will also be inclined to approve.

The subject of pension plans is not a simple one. The union official must rely to a large extent upon the "experts" who do that sort of work for a living. Up to a point, he will have to take their findings at face value.

The paternalistic type of employer usually regards a pension as a gift or gratuity granted as an act of benevolence, or moral duty, to his "old and faithful" employees — in other words, as a bone for *Old Dog Tray*. This is a view which labor cannot accept, for it runs directly counter to the basic principles of trade unionism.

Remember—No Pension Is Free

When a pension plan is brought within the scope of the agreement, both parties thereby acknowledge that it is in fact a part of the hire which the workers are to receive in *exchange* for their labor. It is not "free" and they do not get "something for nothing" as an act of grace on the part of the employer. They earn it and pay the employer for it by doing the work which constitutes their end of the contract.

The performance of that work is all the employer has a right to expect in return for his contributions to the pension fund. The amounts contributed by the employer to the fund, to finance the pension credits accumulated by the group during the term of the contract, should therefore be an irrevocable payment which the employer cannot withhold or recapture, just as he cannot withhold or recapture cash wage payments.

The workers' interest in the negotiated plan is equally strong regardless of whether the fund is set up formally on a so-called "contributory" or on a "non-contributory" basis. In the sense that the contributions paid in by the employer have been earned by the workers, they actually pay the full amount of the cost in either case.

Management's Viewpoint Anent "Costs"

Pensions are a labor cost item, like all of the other economic terms of the working agreement. Viewed solely from this standpoint, it should make little real difference to the employer whether that cost is incurred in the form of contributions to a pension fund, or in the form of higher wages, paid vacations, a health insurance plan, or a reduction in standard working hours.

Under normal conditions most unions must eventually decide whether the interests of the members would be better served by going after a pension or by concentrating on the task of improving the wage scale. This is a decision which each union must make for itself, in the light of its own particular circumstances.

Pension Funds are Limited in Use

In considering this issue, certain facts should be borne in mind. Pension funds are designed to serve but a single major purpose: to help meet the need for an assured income after a person's working life is over. Depending upon the person's present age, that particular contingency may be relatively remote as compared with other more pressing ones.

In contrast, a wage increase can be used for any number of purposes. It may be added to savings or used to provide an immediate higher standard of living. As liquid savings it will be available for other urgent needs as well as that of old age—the education of one's children, medical expenses, living expenses during unemployment, payments on a house, or anything else that chance or choice might require.

These are economic problems which most workers must face long before they reach old age. A pension fund in which their equity is frozen until retirement will not help to meet them. Only cash wages can do that.

Economic Ability to Finance Plan

This being the case, the priority which a union will assign to a pension plan in its negotiations may depend upon the extent of its present old age problem in relation

to the extent to which its members are presently able to meet other pressing economic needs.

In extreme cases, the answer should be fairly obvious. Where the wage scale of a particular group of workers is at or near the bare subsistence level—or too low to provide decent food, clothing, housing or medical care—wage increases should be the first order of business.

Even though the problems of the aging in such a group are very serious, to sacrifice a possible wage increase in order to set up an expensive private pension plan would leave that group "insurance poor". This is one of the many reasons why private retirement plans can never meet the broad national problem of old age isecurity. The Federal Social Security system is the only practical means of solving that larger problem.

PERSONAL NOTES

C. J. BACHMAN has joined the Fairchild Equipment Co., of Whitestone, N. Y. as theatre equipment products manager. Bachman comes from the Stanley-Warner theatre chain where he served as chief engineer. His intimate knowledge of theatre equipment installations over a period of more than 20 years will be of great value in his new position. He recently supervised 32 complete CinemaScope installations and, in addition, was responsible for the complete physical plant of 52 chain theatres.

R. EDWARD WARN, vice president of Westrex, has arrived in New York, where he will take up new duties as director in charge of Westrex foreign operations. He has been manager of the Westrex Hollywood division since 1949.

C. S. PERKINS is now operating manager of Altec Service Corp., succeeding Elmer O. Wilschke, who recently resigned to become vice-president of Fine Sound, Inc. Perkins has been division manager of Altec's Northeastern division since 1947, after being manager of the company's commercial engineering department.

Perkins has an extensive technical background. He was at one time a member of the laboratory department of General Radio Co., and an instructor at the Massachusetts Radio and Telegraph School. He entered the film industry in 1929 with ERPI, serving in various executive capacities.

Among his earlier assignments was the technical supervision of installations and service operations in Ohio, and also as the field engineer in the Detroit area. He was later advanced to other supervisory posts in St. Louis, Providence and Boston. During World War II he managed essential war activities at Altec's electronics division at Lexington, Mass.

C. S. Perkins, newly appointed operating manager for Altec Service Corp.

LYMAN SUITER has been promoted to general plant manager of the Fairchild Recording Equipment Co., Whitestone, N. Y., manufacturer of Perspecta Sound integrator units.

ROY BOOMER, secretary-treasurer of TESMA, announced his retirement recently after serving in that capacity since the group was reorganized nine years ago. However, Boomer and his wife Charlotte attended the recently concluded TESMA-TOA convention in Chicago.

RALPH KAUTZKY has been appointed acting manager of Altec Service Corp.'s northeastern division, succeeding C. S. Perkins, who has been advanced to operating manager of the organization. Kautzky will direct operational activities of Altec's northeastern engineering field force from the division offices, 254 West 54th St., New York City. He joined ERPI, predecessor of Altec, in 1928.

Succeeding Kautzky as branch manager of Altec's northeastern division is SHELL TRENT, a veteran in the field of theatre sound service, who was a member of the technical field staff of ERPI. His headquarters will be at 254 West 54th St., N. Y. City.

"C & C" Rectifier Data

Arclamp rectifiers designed for big-screen requirements are discussed in Bulletin AL-54 just published by the McColpin-Christie Corp., designers and manufacturers of theatre rectifiers.

The booklet points out that the McColpin-Christie "C & C" line of rectifiers includes a unit to provide continuous D.C. power for any type of standard, wide-screen or 3-D projection, for 1 kilowatt to Hy-Candescent.

Designed with a 12-phase output circuit, the 3-phase units takes 3-phase alternating current from the power line and rectify it into a flickerless light source, the company states. This feature, plus the special "C & C" transformer designed for safet short-circuit vurrent surely provides maximum arc stability. Single-phase units, filtered to give low ripple, are available for locations where 3-phase power can not be obtained.

Dr. John Frayne, Westrex, Named President of SMPTE

Dr. John G. Frayne, engineering manager for Westrex Corp., Hollywood, has been elected to the presidency of the Society of Motion Pictures and Television Engineers for the 1955-56 term.

Dr. Frayne is a recognized technical authority on sound recording and reproducing equipment, his name being known in sound recording studios throughout the world. He is co-author of the widely accepted book on studio recording, "Elements of Sound Recording." He either wrote or collaborated with others in writing more than twenty technical papers, most of which were published in the *Journal* of the SMPTE. He also has had ten U. S. patents granted in his name.

Dr. John G. Frayne, recently elected president of the SMPTE

Dr. Frayne is in charge of all development work for the Westrex Corp. on both magnetic and photographic recording. It is under his direction that the new Westrex equipment for both single- and multi-track magnetic recording has been brought into being and is now in use in many studios throughout the world, including the majority of studios in Hollywood.

Giant Intra-Industry Conclave in Chicago

ONE of the most inspiring and heartening events in intra-industry relations — and still one which did not, in the writer's opinion, realize its maximum possible potentialities — occured in Chicago during the early part of this month. This event was the Equipment and New Processes Forum at the combined conventions of the Theatre Owners of America (TOA); Theatre Equipment Supply Manufacturer's Association (TESMA), and the Theatre Equipment Dealers Association (TEDA).

Because projection processes and equipment are the primary concern of IP, complete candor compels the statement that the much-ballyhooed Equipment and New Processes Forum, which was expected to provide solid, down-to-earth practical information, was a dud. This deficiency in what could easily have been the most informative of all sessions from a technical point of view is traceable directly to its agenda. The program and format of this forum required from the speakers time-consuming expository statements of data which had already been profusely circulated in the industry trade press.

What would have been vastly more interesting would have been explanatory comment and practical suggestions on how to best use the variety of radically different new equipment now being introduced in the theatre field. The kind of comment we are talking about would be informal and directly to the point. It would be most successful during the give-and-take of a hot question-and-answer bull session between manufacturers, exhibitors and projectionists.

Many projectionists attended the forum and took the trouble to travel long distances to get there. They, as well as exhibitors and manufacturer participants, would have jumped at the opportunity to present interesting questions to the forum had not the time been whittled away by the long expository statements of the forum.

It is our opinion that very brief statements by each panel member — to introduce him and start the ball rolling, followed by a longer period of informal questions and answers, might have clarified many of the troublesome technological problems that now beset the film exhibition industry. Some feelings might have been ruffled, but the results might have been of enormous value.

Loren Ryder and Earl Sponable, technical heads of Paramount and Fox, were featured speakers at the forum. Ryder discussed the three types of prints which will be available to theatres for projecting pictures made in the VistaVision process—the standard, the anamorphic, and the new double-frame print which runs on a horizontal film path through a special projector as described in IP last month.

Earl Sponable stated that Fox is now at work on improvements in the CinemaScope process which will give better screen results without any further changes in equipment.

Other speakers included Jack O'Brien, manager of RCA's theatre equipment sales, Leonard Satz, Raytone Screen Corp.; A. E. Neumer, Rausch & Lomb Optical Co., and A. J. Hatch of the Strong Electric Corp.

Panel members were: Fred C. Matthews, TESMA; Nash Weil, TEDA; A. E. Meyer, International Projector Corp.; Louis E. Pope, Fox Midwest; Edwin Gage, Walter Reade Theaters; Joseph Zaro, Bijou Amusement Co.; E. J. Nelson, Ballantyne Co.; John R. Miles, Projection Optics; F. C. Dickely, Altec Service Corp., and Robert Gottschalk, Panavision.

Alex Harrison, Western sales manager of 20th-Fox, served as moderator.

These three beaming gentlemen represented Raytone Screen Corp., at the recent TOA-TESMA convention in Chicago. Standing left to right in front of the Raytone display are Leonard Satz, secretary-treasurer; Wes Thompson of Raytone-Thompson Frames, Sun Valley, Calif., and Sol Shurpin, president of Raytone.

There is no doubt at all, however, that one phase of the convention was a smashing success. The wide variety of displays of the latest in projection, sound and electric power equipment by members of TESMA in the Conrad Hilton Hotel exhibit hall was undoubtedly the most interesting and elaborate ever assembled. It drew compliments from all sections of the film industry — from Hollywood production executives to practical projectionists.

A significant point was the large amount of display space alloted to exhibits of power supply units. This, the writer believes, shows a growing awareness of the need for completely re-equipping many theatres if sufficient light is to be had for presenting high-quality pictures on wide screens.

Correct Use of Variable Anamorphics

IP emphasizes anew the perfectly obvious but never-mentioned FACT that a variable anamorphic lens may be used to project a screen image ONLY in that aspect ratio in which the picture was originally shot in the studio—allowing for a maximum ratio tolerance of between 5 and 10%, preferably the former.

All pronouncements, advertising and editorial, relating to the variable anamorphic lenses which have come to the attention of IP—no less than private conversations with the makers of such lenses—convey the impression that ANY picture may be shown in ANY aspect ratio. This is definitely not so.

IP reiterates its oft-stated advice that extreme caution must be exercised when using any variable anamorphic lens so that the aspect ratio of the projected image will conform, within the aforementioned tolerance range, with the aspect ratio in which the picture was shot.

Definitions of Major Terms In Stereography

Aspect: Either right or left view taken as a whole. Also known as a "field."

Composite Image: The resultant sensation experienced by a spectator by the proper viewing of disparate images.

Diplopia: The conscious sensation of seeing a single object as double.

Discriminating Device: Any contrivance which allows each aspect to reach only the eye for which it is intended.

Disparate Images: Two slightly different views of the same subject, one view being intended only for the left eye; the other only for the right.

Fixate: To direct one's eye upon a point.

Point Pairs: Right and left image points on the screen which, when fused by the spectator, appear as a single point in space.

Snellen Acuity: A measure of the spectator's ability to see the separation between two points close together.

Stereography: The application of stereoscopy to photography.

Stereopsis: Perception of depth by the fusion of disparate images.

Stereoscopic Cinematography: Motion-picture photography which allows the spectator to perceive depth.

Vernier Acuity: A measure of the spectator's ability to see the offset from a line of a portion of that line.

Vertical Divergence: The vertical angle between the optic paths to each eye.

Visual Perception: The mental result of the influence of the psychological condition of the spectator upon a visual sensation.

Visual Sensation: A primitive mental reaction to a stimulation of the retina by light waves.

Compound for Drive-in Screens

RCA announces that "Cinemaplastic," a vinyl plastic compound for brightening and weatherproofing drive-in theatre screens, has been added to its line of theatre products. Manufactured by Protective Coatings, Inc., the compound is asserted to have high reflective power and to provide an economical means of increasing light in many drive-in situations.

Altec Perspecta Sound Unit

Altec Service Co. has announced that its manufacturing subsidiary, Newpaths, Inc., will begin deliveries this month of Perspecta Sound integrator units for obtaining stereosound from a single cued optical track.

To build profitable repeat patronage...

Scene from "THE EGYPTIAN," 20th Century-Fox CinemaScope Epic

sharpest image, edge-to-edge...

most uniform light distribution...

on any screen!

Bausch & Lomb

f/1.8

Super Cinephor

Projection Lenses

- Normal 2D-3D
- Expanded 2D-3D
- CinemaScope

Write for new catalog E-123.
Bausch & Lomb Optical Co.,
61635 St. Paul Street,
Rochester 2, New York.

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SINCE 1853

Behind this man . . .

The facilities of RCA Service Company make available to thousands of theatres throughout the country the vast technical resources of the Radio Corporation of America.

Problems posed by optical or magnetic sound, single or multiple track, 2-D, 3-D or wide screen techniques are minimized when RCA Service Company is behind the vital, operating heart of *your* house.

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RCA SERVICE COMPANY, Inc.

A Radio Corporation of America Subsidiary

Camden, N. J.

Exhibitors at Chicago Trade Show

ALTEC LANSING CORP.
Beverly Hills, Calif.

ALTEC SERVICE CORP.
New York, N. Y.

AMPEX CORPORATION
Redwood City, Calif.

C. S. ASHCRAFT MFG. CO., INC.
Long Island City 1, N. Y.

AUTOMATIC DEVICES CO.
Allentown, Penna.

THE BALLANTYNE COMPANY
Omaha, Nebraska

BAUSCH & LOMB OPTICAL CO.
Rochester, N. Y.

BELL & HOWELL COMPANY
Chicago, Illinois

CAPITOL STAGE LIGHTING CO., INC.
New York, N. Y.

CENTURY PROJECTOR CORP.
New York, N. Y.

CONTINENTAL ELECTRIC CO.
Geneva, Illinois

DAWO CORPORATION
Toledo, Ohio

DIECAST ALUMINUM SPEAKERS, INC.
St. Louis, Missouri

DRIVE-IN THEATRE MFG. CO.
Kansas City, Mo.

EPRAD COMPANY
Toledo, Ohio

FAIRCHILD RECORDING EQUIPMENT CO.
Whitestone, N. Y.

WALTER FUTTER
New York, N. Y.

GOLDBERG BROTHERS
Denver, Colorado

GORDOS CORPORATION
Bloomfield, N. J.

INTERNATIONAL PROJECTOR CORP.
Bloomfield, N. J.

THE KNEISLEY ELECTRIC CO.
Toledo, Ohio

KOLLMORGEN OPTICAL CORP.
Northampton, Mass.

LaVEZZI MACHINE WORKS
Chicago, Illinois

LORRAINE CARBONS, INC.
Boonton, N. J.

MAGNASYNC MFG. CO., LTD.
North Hollywood, Calif.

MOTIOGRAPH, INC.
Chicago, Illinois

NATIONAL CARBON COMPANY
New York, N. Y.

NATIONAL-SIMPLEX-BLUDWORTH, INC.
New York, N. Y.

NEUMADE PRODUCTS CORP.
New York, N. Y.

NORPAT SALES, INC.
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PAROMEL ELECTRONICS CORP.
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PROJECTION OPTICS CO., INC.
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RADIANT MANUFACTURING CORP.
Chicago, Illinois

RADIO CORP. OF AMERICA
Camden, N. J.

RAYTONE SCREEN CORP.
Brooklyn, N. Y.

J. E. ROBIN, INC.
East Orange, N. J.

STELMA, INC.
Stamford, Conn.

THE STRONG ELECTRIC CORP.
Toledo, Ohio

SUPERIOR ELECTRIC CO.
Bristol, Conn.

WENZEL PROJECTOR CO.
Chicago, Illinois

EDW. H. WOLK COMPANY
Chicago, Illinois

WOLLENSAK OPTICAL COMPANY
Rochester, N. Y.

Brain Wave Travel by Phone

University of Nebraska scientists, working with Bell Telephone engineers, have worked out a system for sending electroencephalograms (brain waves) over a long distance telephone line. This makes it possible for a medical specialist to make a diagnosis involving a patient in a distant city without leaving his office.

The word "electronic" was coined by Michael Faraday in 1832.

SPLICES NOT HOLDING ?

Film breaks are costly.
Play safe by using

JEFRONA

All-purpose CEMENT

Has greater adhesive qualities. Don't take our word for it. Send for FREE sample and judge for yourself.

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DEPT. J-11-8
1600 Broadway New York 19, N. Y.

LENS CLEANING PROCEDURE

The vital importance of proper handling of projection lenses with any and all reproduction processes induced the appended communication from Kollmorgen Optical Co. relative to the proper method of cleaning projection lenses. These pointers are offered as a help to projectionists.

Since anti-reflection coating is hard, the same procedure should be used for coated or uncoated lenses.

1. Remove lens from projector at least twice a day for cleaning.

2. Remove all particles of dust or lint with a *clean* camel's hair brush, which should be used *only* for this purpose.

3. Wet sheet of clean "Lens Tissue" in any good liquid lens cleaner similar to the "Guild Craft" lens cleaner, grain alcohol or acetone, and wipe the surfaces gently but thoroughly.

4. Cloths of any character are not recommended for cleaning. Use LENS TISSUE.

5. Dry the surface with a clean dry piece of Lens Tissue.

6. *Never* use cloth of any type or *treated* lens tissue. Never use soap, water, glass cleaners or powders.

7. Never attempt to open Super or Series II Snaplite lenses, since they are factory-sealed to eliminate oil seepage.

Altec Lansing—Perspecta Deal

Altec Lansing Corp. completed a licensing deal to manufacture Perspecta stereo sound integrator units, and immediately swung into production thereon. This unit is the only piece of special equipment required to for standard optical-track stereo sound reproduction, which system has been adopted by Paramount, Metro and Warner Bros. The Altec integrators will be ready by Fall.

RCA Service Co. Awards

Following members of RCA Service Co. have been honored as a result of a three-month campaign directed at maintaining a high degree of efficiency in the field. Leading in 160 RCA Service branches were Orval Bowers, Flushing, N. Y.; William Davis, Indianapolis; James K. Stewart, Salt Lake City; Lawrence Traeger, Spokane, and Acie Criss, Montgomery, Ala.

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FROM A TOY TO A GREAT INDUSTRY

(Continued from page 16)

knob on the side with a crank.

This first peep-show movie machine he called a "Kinematoscope." As the pictures revolved into view from back to front, they did produce the illusion of movement. But they were not actually pictures of motion, for the individual poses depended upon the models' and photographer's often inaccurate concepts of the phases of a given action.

First "True" Motion Pictures

The first true motion pictures were taken by Eadweard Muybridge in a series of experiments begun at the Sacramento, Calif., race track in May, 1872. Muybridge's now-famous technique involved lining up some 20-odd stereo cameras along the edge of the track, each equipped with an electromagnetic shutter. These shutters were set off by means of switches attached to a series of parallel threads stretched across the track. As a horse galloped by, the threads were successively broken, tripping the switches and setting off each camera just as the horse passed in front of it.

We have all heard of the famous controversy over whether horses ever had all four feet off the ground at the same time. Well, Muybridge's pictures proved that they did, but never when the legs were outstretched, as some artists had drawn them. Some critics charged that they were a mechanical fraud.

To prove that his pictures were authentic, Muybridge determined to synthesize them into the original action. To achieve this, he mounted some of his pictures on Zoetrope cards, putting the left half of each stereo pair on one card, the right half on another. These he placed in two Zoetropes, making the stereo pairs simultaneously visible to the observer by means of mirrors. When the cylinders were rotated in synchrony, doubters could watch a movie of a race horse galloping in 3-D right before their eyes.

Later, to demonstrate his pictures to *groups*, Muybridge built a variation of Uchatius' projection Phenakistoscope which he called a "Zoo-

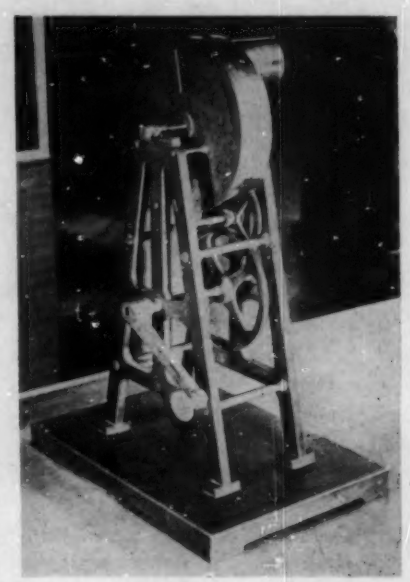

FIG. 4. Actually designed by Thomas Edison, the unit above resembled Muybridge's device.

praxiscope!" It consisted of a rotating glass disc on which he carefully mounted 17 to 21 glass transparencies of his animals in various stages of an action. In front of the disc was a metal shutter with a single radial slot. By means of a gear train, the shutter made one revolution while the disc moved only one frame.

The result must have looked something like the device shown in Fig. 4 (an early experimental apparatus built by Edison). A magic lantern lamphouse illuminated the picture from the rear, and an objective lens in front projected the picture on a screen. Thus Muybridge projected in 1861 the first *true* motion pictures. As he pointed out, "these apparent movements could be continued for a period limited only by the patience of the audience"—he was continuously projecting the same 21 frames.)

[TO BE CONTINUED]

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Du Pont 'Cronar' Film Base

Extraordinary structural and operating characteristics are attributed to the new polyester photographic safety film base developed by Du Pont. Produced only in small quantities as yet, this film base, which is trade-marked "Cronar," is asserted to be several times tougher than present types of safety film base, to have less tendency to shrink, and to be equally flame-resistant.

Limited quantities of the "Cronar" base are now available commercially for use as leader material for motion picture processing. It has been produced in experimental quantities since 1952 in a pilot plant at Parlin, N. J. where a large-scale commercial plant, scheduled to be ready in 1955, is under construction.

A condensation polymer-technically known as polyethylene terephthalate, Cronar polyester film base is chemically related to two other recently introduced Du Pont products—Dacron textile fibre and Mylar polyester film which has many electrical and other applications.

Du Pont Test Results Cited

In tests of folding-resistance, Cronar film base is credited by Du Pont to have withstood an average of 17,000 flexings. Motion picture film on Cronar base showed virtually no signs of perforation damage after 3,900 runs through a motion picture projector, it was asserted, while regular safety film perforations wore out after 1,400 projections.

Greater toughness of Cronar base is said to permit the reduction in thickness of motion picture film from the standard 5.5 mils to 4 mils (0.0055 inches to 0.004 inches), making it possible to considerably reduce shipping weight and storage volume. The standard 2000-foot reel can accommodate 2700 feet of Cronar-base film.

The new film base will be edge-marked as Du Pont "Cronar," Safety for the guidance of projectionists and others.

Film industry observers are awaiting some indication as to the cost of this Cronar film, because this would seem to be the most vital factor despite any other advantages credited to this new base. Also, it was pointed out that prints are seldom discarded because of rip or tear damage but rather because of emulsion deterioration due to excessive heat, scratches, *etc.* Buckling characteristics, the result of exposure to high-intensity arcs, is another very important factor.

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Standard Lens	Variable Focus From
3"	2¼" to 1¾"
3½"	2¾" to 2"
4"	3¼" to 2¼"
4½"	3½" to 2½"
5"	4" to 3"
5½"	4½" to 3½"
6"	5" to 3½"

WRITE for new literature fully describing this supplementary lens. Wollensak Optical Co., Rochester 21, N. Y.

MASTERPIECES of Optical Craftsmanship by WOLLENSAK

CONDENSING SYSTEMS

(Continued from page 14)

a few mm of the condenser in enlargers and Balopticon projections to a considerable distance as in motion pitcure projection.

The second arrangement obviously provides a more compact system at a given *f* number and focal length projection objective.

Relay Condenser System

A third arrangement has found some application in special problems. This arrangement is essentially the second in that an image of the source is placed in the entrance pupil of the projection lens, but by aid of two extra lenses in the train the gate illumination is increased and made much more uniform. The two extra lenses relay the images of one of the condensers and the filament to their appropriate places, thus the name "relay system".

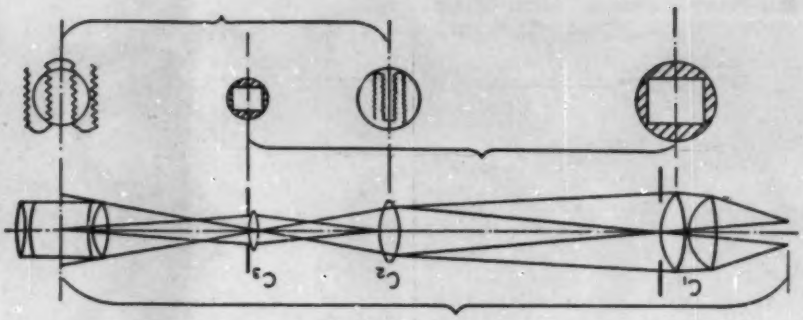

FIG. 6. A typical condenser relay system. Conjugate images are bracketed together.

In a conventional aspheric condenser system (Fig. 6) C_1 is used to image the light source in the lens C_2, which images the last surface of the condenser C_1 on the gate. We have already seen that this surface is uniformly illuminated. At the gate is placed a third condenser lens, C_3, which images lens C_2 and the filament image in the projection lens.

To cut down the spill of light at the gate, the condensers C_1 may be masked as shown in the illustration. This arrangement has the advantage of greater illumination and potentially greater uniformity, but these advantages are purchased at the cost of complications in added lenses and light lost through reflection and absorption. Of course, lens C_3 which receives the filament image must be of highly heat-resistant glass.

Image Magnification Set-up

In order to collect as much flux as possible, the light sources are placed as close as practicable to the first lens of the condensing system. This has the effect of producing a magnified image of the source.

In the first arrangement, the arc is imaged at the film gate at a magnification just sufficient to give an illuminated area covering the corners of the gate. This generally suffices to give an evenly illuminated gate, if the arc itself is uniform, but because the gate is not square a certain amount of useful light is lost in illuminating the long sides of the aperture.

In the second type of condensing system, due regard must be paid to the size of the image of the filament as well as to the *f* number of the system, for if the image is too large for the projection lens, light will be wasted, while if it is too small, the lens may be stepped down optically and thus not deliver the maximum light.

[TO BE CONCLUDED]

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WESTREX FOREIGN MANAGERS AT N. Y. TECHNICAL MEET

Westrex president E. S. Gregg is shown describing for foreign representatives the new multi-channel amplifier system. Pictured here (left to right) are:

J. A. Todd, recording manager in England; J. Cuevas, manager in Brazil; J. Y. Abe, director and assistant manager in Japan; P. Amourgis, manager in Egypt; R. Senechal, recording director for France and Belgium; M. Sterms, Venezuela, manager in the Caribbean area; to the rear, R. J. Hortis, manager in Argentina; W. E. Kollmyer, manager in Australia; to the rear, K. Kagara, recording engineer in Japan; O. J. Forest, Trinidad, manager in the Caribbean area; W. De Mello, Cuba, manager in the Caribbean area; E. S. Gregg, president of Westrex, and C. Alderstrahle, manager in Scandanavia.

Managers and heads of recording departments from some of Westrex Corp. subsidiaries in Europe, Africa, Australia, and Latin America attended a conference in New York, from November 8 through 19. The conferees discussed new equipment operational techniques and surveyed Westrex sales and servicing activities in the motion picture studio and theatre equipment fields, as well as teletype, teletypesetter, communications, and other electronic apparatus.

The featured displays of new equipment included Westrex's latest developments: single and multi-channel sound systems for theatres, the film editing machine, multi-channel magnetic recording systems, the type RA1524 six-position mixer console, the 35-mm newsreel recording system, the new re-recorders, electrical printing equipment, the new hot-stylus lateral feedback disc cutter, and the new black-and-white and color densitometers for studios.

Theatre Tv Hookup for Queen

Large-screen, closed-circuit Tv was used last month to bring the address of Queen Mother Elizabeth of England to guests attending a dinner given for her at the Waldorf-Astoria Hotel in New York City. Her words were carried from the grand ballroom to 1,000 guests in other areas of the hotel through arrangements made by Theatre Network Television. General Precision Laboratory equipment was used for this novel and inspiring inter-building telecast.

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for CinemaScope

WIDE-SCREEN PROCESS UPS INHERENT DEFECTS

(Continued from page 10)

and FP-7) employ the "nut-and-bolt" method. This method should not be confused with the screw-against-shaft method used for fastening feed and holdback sprockets. They resemble each other externally, but there is an important difference.

In the nut-and-bolt method a plain, unthreaded hole is bored all the way through sprocket hub and shaft. Into this hole is dropped a bolt, which is held in place by a nut on the threaded end which protrudes from the opposite side of the sprocket hub.

When the nut is tightened, the sprocket flanges will not be strained out of shape because the sprocket hub is thin and reinforced at both ends by the flanges. Moreover, the shaft is not bent by this method of fastening. Even after the sprocket has been repeatedly removed and mounted again, either in its original position or reversed, the wobble will not exceed 7 microns (0.28 mil). This represents a picture-jump of only 0.073 of an inch on a 13½ x 18-foot screen. Jumpiness does not always attain this *maximum* degree when the nut-and-bolt method of fastening the sprocket is used, of course; but even when it does, the unsteadiness is too small even to be seen by filmgoers in the seats closest to the screen!

The Motiograph Design

The second modern method of sprocket-fastening is truly a marvel, and although it is a bit more complicated than the nut-and-bolt method, it reduces possible 6-cycle dancing of the picture almost to the vanishing point. This second method, which we shall call the "ball and taper-screw" method, is a unique feature of the Motiograph AA mechanism.

The starwheel shaft is hollow as far back as the sprocket, and is provided with a threaded, tapered screw contacting two steel balls which it thrusts outward through holes in the wall of the hollow star-shaft. The balls, thus pushed outward, lock into matching, but smaller, holes in the walls of the sprocket hub.

The actual construction of this sprocket-fastening device in the Motiograph AA has more mechanical detail than is indicated by the accompanying diagram. Not shown, for example, is the Motiograph AA outboard bearing, or the lateral sprocket-positioning screw, or the tubular, threaded insert which prevents the tapered screw from being backed out so far as to drop the two locking balls from their sockets.

Maximum wobble of the intermittent sprocket with the ball and taper-screw method of fastening is only 5 microns (0.20 mil), and this results in a maximum picture-jump of only 0.052 inch in a 13½ x 18-foot picture (standard aperture). This degree of mechanical perfection is desperately needed in these days of wide-screen projection.

Manufacturing Process

There are other factors besides the methods of fastening the intermittent sprocket to be considered in relation to sprocket-wobbling, and many of these involve manufacturing processes and the materials selected for making the intermittent parts. If the starwheel shaft were made of brass, for example, the intermittent would function properly only for a very short time, no matter how careful the workmanship. Inferior steels would likewise be unsuitable for the shaft.

Manufacturers of the better projectors use special chrome-nickel steels for starwheel shafts because such alloys do not shrink, hence are not subject to internal stresses during the hardening process. When the shafts are finally ground to the correct diameter, therefore, they do not show the slightest tendency to warp. The starwheel shafts of good projectors, are ground to a maximum tolerance of 0.04 mil (1 micron).

Admissible Tolerance

The sprocket will wobble if the hole is eccentric with respect to the toothed face, or if it is not perfectly straight. Philips finishes the bore of the sprocket by a grinding process which insures that the diameter of the bore is not larger at the ends than it is in the middle. The bore is thus perfectly straight, and the diameter-tolerance is kept within 0.08 mil (2 microns).

Only after the bore is finished and carefully checked in every respect are the teeth milled and the running surfaces which contact the edges of the film ground. According to projector technologists, the admissible wobble with respect to the bore is under 0.16 mil (4 microns).

[TO BE CONTINUED]

Prefers Stories to "Gimmicks"

The motion picture industry can successfully meet the challenge of Tv if better stories and fewer "gimmicks" are used, according to Ross Hunter, producer of "Magnificent Obsession." A good story, "even if it fits on the face of a postage stamp," will draw customers to the boxoffice, he asserts.

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